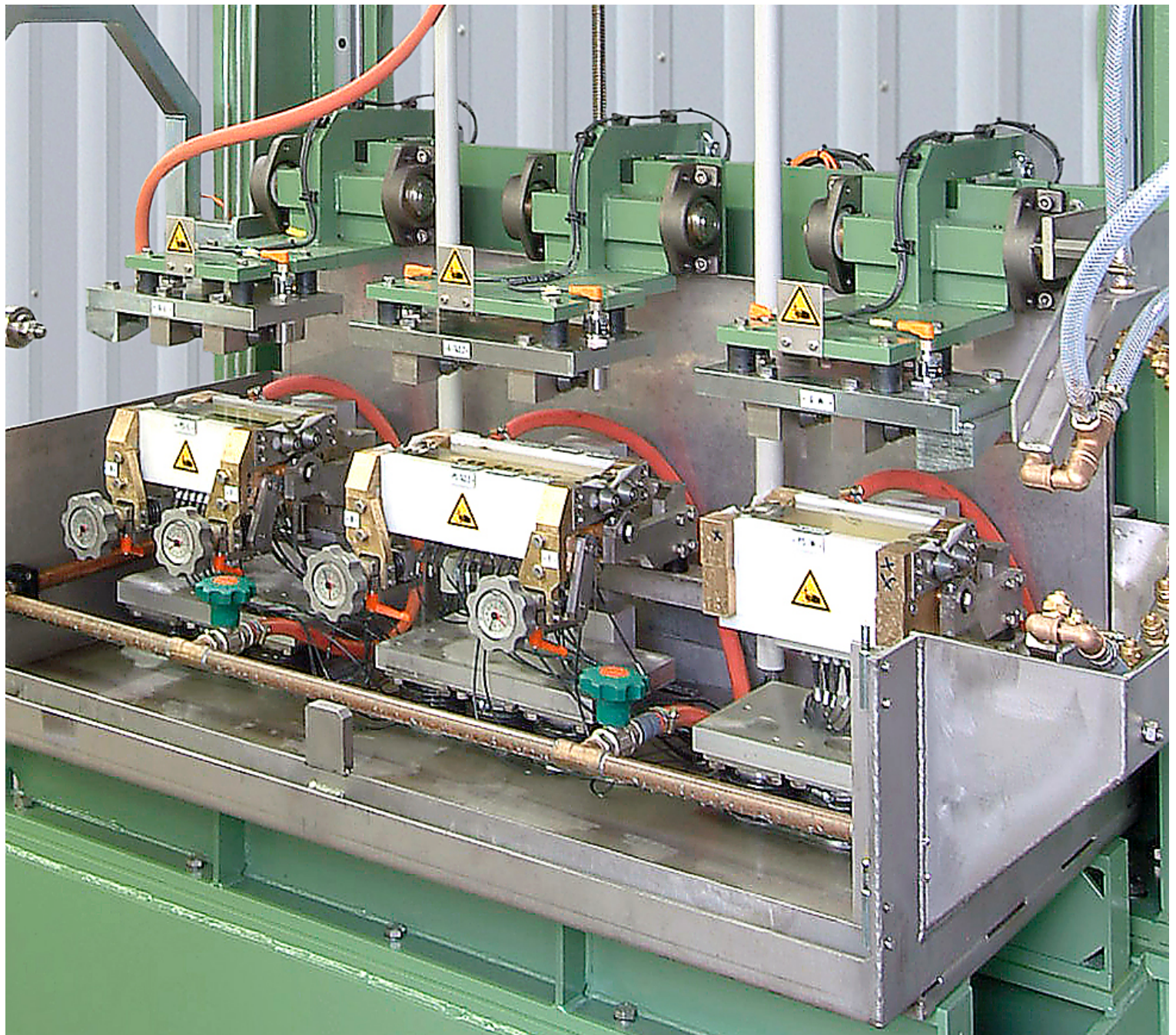




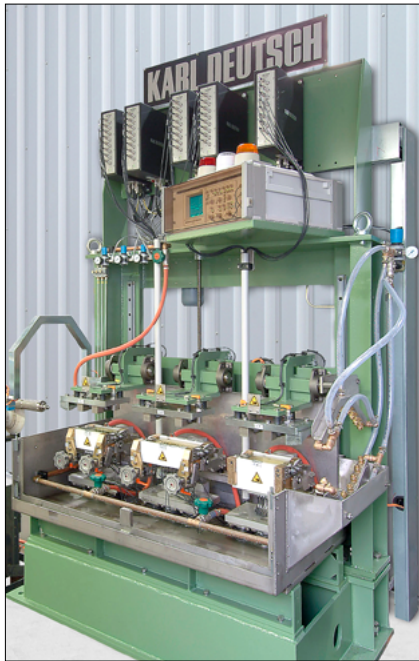
ECHOGRAPH RPSR

Ultrasonic Inspection of Tubes with Helical Feeding

KARL DEUTSCH

ECHOGRAPH RPSR

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View of inspection system with three test chambers (longitudinal and transverse defects, wall thickness).

Ultrasonic inspection of tubes with helical feeding

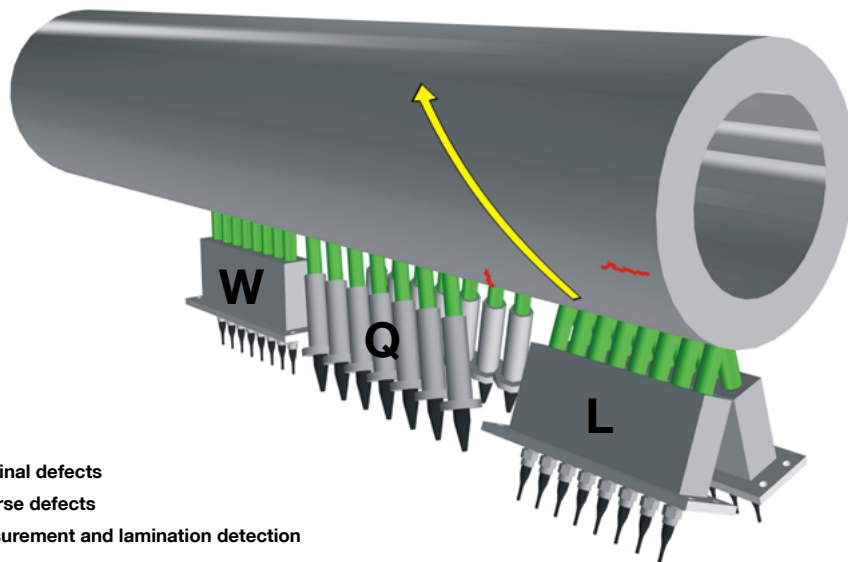
KARL DEUTSCH has developed ultrasonic testing equipment since 1951 and has shipped the first inspection system for seamless tubes more than 50 years ago. Many improvements on the ECHOGRAPH-electronics, the robust testing mechanics and the ultrasonic probes have led to our current state-of-the-art. All components (testing electronics, testing mechanics, ultrasonic probes) are developed and assembled in-house. KARL DEUTSCH maintains a strict quality management system according to DIN EN ISO 9001 which was firstly certified in 1993!

Large tubes with diameters up to 610 mm can be inspected in partial immersion with the ECHOGRAPH-RPSR testing system. Water-filled test chambers are located underneath the tubes and hold several probe

batteries. While the probes remain fixed, the pipes move along the test chambers with a helical motion. Various probe orientations lead to the detection of all flaw types and a measurement of the wall thickness.

For a rotational inspection, the goal is to produce wide test traces for a high throughput rate. This is achieved by using special-made probe batteries which hold several probe elements in one housing while the gaps between the elements should be kept as narrow as possible.

For conventional electronics, typically 8 channels are used per test task. When using the phased array technique, 128 channels per test task are typically used. In both cases, a helical test track of 80 – 100 mm is achieved.



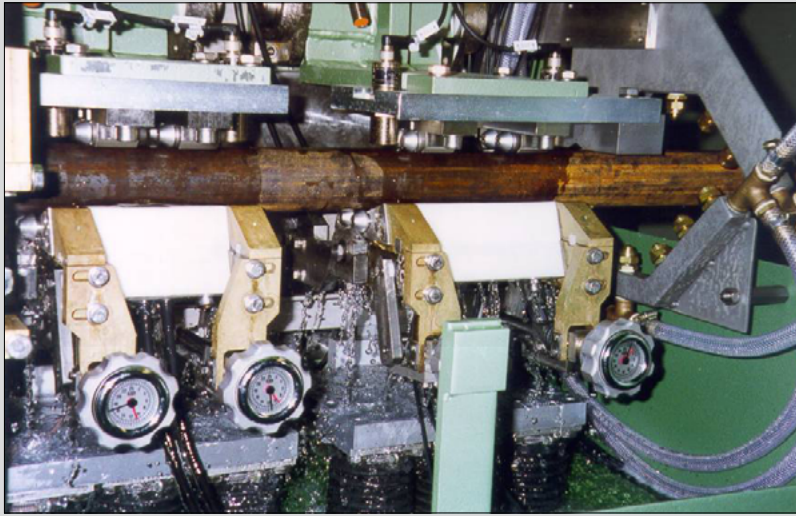
L = detection of longitudinal defects
Q = detection of transverse defects
W = wall thickness measurement and lamination detection

Typical probe configuration for tube inspection in partial immersion and with helical tube feeding:

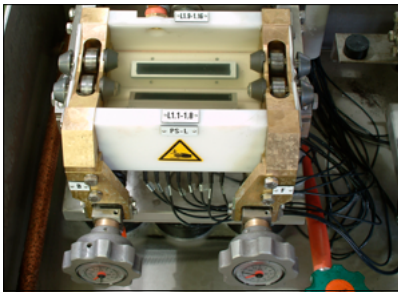
In this case, 16 channels are used for the angular testing functions (longitudinal and transverse defects) for a full coverage of the tube and a feeding per revolution of approx. 80 mm. The wall thickness is measured with an 8-channel probe battery which straight beam ultrasonic incidence. Solutions using phased array probes are also possible!

ECHOGRAPH RPSR

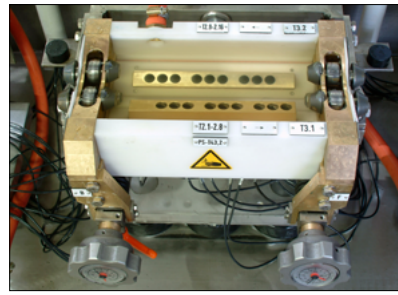
Ultrasonic Inspection of Tubes with Helical Feeding



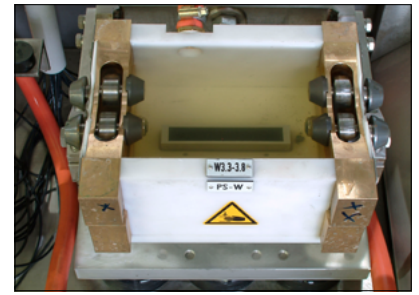
View of two test chambers for ultrasonic testing in partial immersion (probes below tube in water filled chamber). The shown testing system uses one chamber for the detection of longitudinal defects. The second chamber is used for transverse or oblique defects. The dials are used for adjusting the incidence angles of the ultrasonic probes.



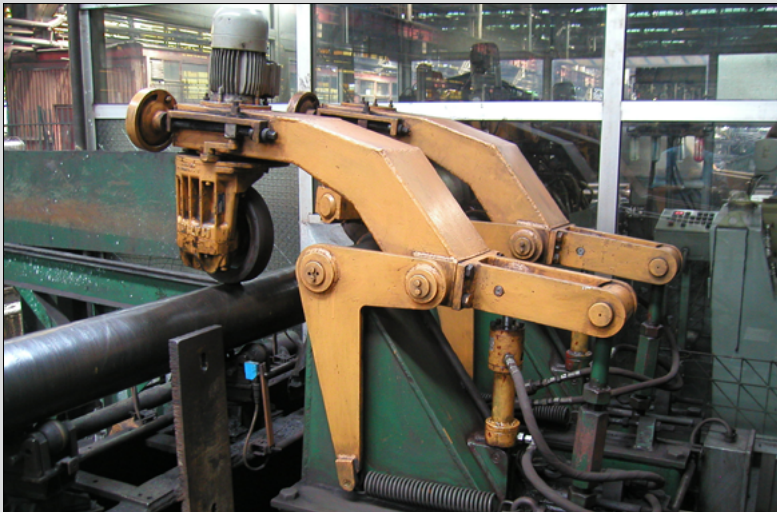
Test chamber for longitudinal defects



Test chamber for transverse (or oblique) defects



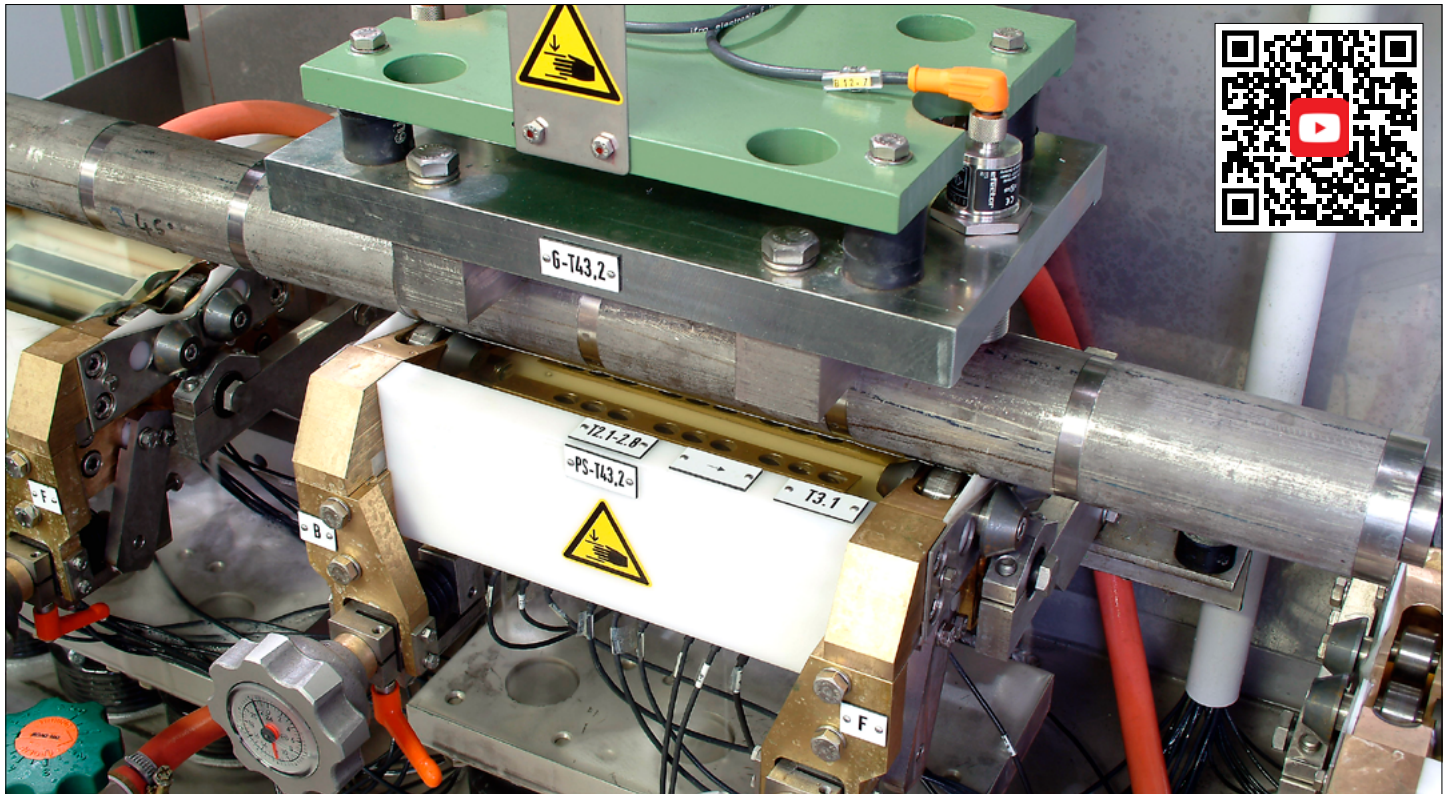
Test chamber for wall thickness measurement and lamination detection



Examples for the helical tube conveyor which must provide a transport of the tubes without vibration. The rotational and the linear tube speed must be perfectly synchronised for the respective tube diameter. Therefore, the angles of the supporting rollers (below the tube) and the pressure rollers (above the tube) are adjustable with respect to the tube axis.

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Ultrasonic Inspection of Tubes with Helical Feeding



The calibration of the testing system is carried out with tubes carrying artificial defects. Longitudinal and transverse notches on the internal and external tube surface are used for the calibration of the angular testing functions. Flat bottom holes or notches can be used to calibrate the straight beam probes.

ECHOGRAPH RPSR

Applications	seamless or welded tubes
Processing stage	rolled, drawn, stretch-reduced, welded
Diameter range (D)	25 – 630 mm (in different mechanical setups)
Wall thickness (s)	> 1 mm
s/D-Ratio	< 0.2
Length	> 2.5 m
Ovality	max. 1 % of D
Straightness deviation	max. 2 mm/m
Surface condition	as rolled, no loose scale
Tube end condition	machined without burr and without upset ends (e.g. drill pipes)

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DIN EN ISO
9001
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